

- 23 -

CLAIMS

1. Method to produce in a mold (30, 130, 230) polyurethane articles (37, 137, 237) covered on at least one side by at least a film (19), wherein polyurethane is introduced inside
5 a molding cavity (28) defined by the coupling of a first part (12, 112, 212) and a second part (13, 113, 213) of said mold (30, 130, 230), wherein a step is provided wherein said film (19) is made to adhere to at least one zone of at least one of said first (12, 112, 212) or said second part (13,
10 113, 213) of said mold, wherein a heating step is provided to heat at least one part or segment of said film (19) which precedes the step wherein said film (19) is made to adhere to said zone of one of said parts (12, 112, 212; 13, 113, 213), said heating step being performed, by means of at
15 least a movable heating assembly (15), in an intermediate position between a first position outside said mold (30, 130, 230) and a second position associated with said mold (30, 130, 230), characterized in that in said heating step said film (19) is also at least partly pre-formed.
- 20 2. Method as in claim 1, characterized in that said pre-forming is performed by selectively activating vacuum means (45) associated with said heating assembly (15) in order to guarantee the constant contact of a substantial part of the surface of said film (19) with a heating element (39) of
25 said heating assembly (15).
3. Method as in claim 1 or 2, characterized in that it provides that said vacuum means (45) that perform the pre-forming are arranged and act only on the perimeter portion of the segment of film (19) which is outside with respect to
30 the figure of the article and which, during the completion of the cycle, is trimmed and eliminated.
4. Method as in any claim hereinbefore, characterized in that said pre-forming step is performed in coherence with

- 24 -

the subsequent thermoforming step carried out inside the mold (30) in order to reduce the time required for said subsequent thermoforming step.

5 5. Method as in claim 1 or 2, characterized in that, while the polyurethane is introduced into and polymerized in the mold (30) in order to achieve a first article (37) covered with a first film (19), outside the mold (30) a second film (19) for a second article (37) is subjected to heating by the heating assembly (15).

10 6. Method as in any claim hereinbefore, characterized in that in association with the perimeter edge of said second part (13) ring-nut means (22) are arranged in order to position a film (19) inside said mold (30).

15 7. Method as in any claim hereinbefore, characterized in that said first part (112) and said second part (113) are hinged together and are closed in book-like manner in order to make articles (137) covered on both sides by films (19).

20 8. Method as in claim 7, characterized in that said heating step provides a first sub-step wherein a first film (19) is heated and positioned in cooperation with said first part (112), and a second sub-step wherein a second film (19) is heated and positioned in cooperation with said second part (113).

25 9. Method as in any claim from 1 to 6 inclusive, characterized in that said first part (212) and said second part (213) are unconstrained from each other and are superimposed so as to make articles (237) covered by a film (19) on one side only.

30 10. Method as in claim 9, characterized in that said heating step provides a first sub-step wherein a first heated film (19) is positioned in cooperation with said second part (213), and a second sub-step wherein a second film (19) is heated and pre-formed outside said mold (230).

- 25 -

11. Method as in any claim hereinbefore, characterized in that, at least in the coupling step of said film (19) and said heating assembly (15), it provides to selectively activate first vacuum means (43) provided at least on the periphery of said heating assembly (15).

12. Method as in any claim hereinbefore, characterized in that, before and during the thermoforming step of the film (19) inside said mold (30, 130, 230), it provides that vacuum means (48, 49) provided at least on the periphery of said heating assembly (15) are activated to retain the film (19) on the perimeter, said film (19) being pressed between the heating assembly (15) and the perimeter edge of the mold (30, 130, 230) and are then released, possibly introducing ambient air.

13. Method as in claim 3, characterized in that said pre-formed film (19) is associated with a part conformed as a punch of said mold (30).

14. Method as in any claim hereinbefore, characterized in that said heating assembly (15) is supplied with at least an insulating element (40).

15. Device to produce polyurethane articles (37, 137, 237) covered on at least one side by at least a film (19), said device comprising at least a mold (30, 130, 230) provided with a first part (12, 112, 212) and a second part (13, 113, 213) able to define between them a molding cavity (28) inside which polyurethane material is able to be introduced, the device also comprising a movable heating assembly (15) able to heat said film (19), before it is inserted into the mold (30, 130, 230), and to position said heated film (19) in cooperation with said first (12, 112, 212) or second (13, 113, 213) part of said mold (30, 130, 230), characterized in that said heating assembly (15) comprises a bearing structure (16) on which are mounted at least a heating

- 26 -

element (39) and a frame (41) able to support anchor means (21) to anchor, at least temporarily, said film (19) to said heating assembly (15), said frame (41) including vacuum means (45) able to be selectively activated to make a substantial part of the surface of said film (19) adhere to said heating element (39) and perform an at least partial pre-forming of said film (19).

16. Device as in claim 15, characterized in that said vacuum means (45) that achieve the pre-forming are arranged and act only on the perimeter portion of the segment of film (19) which is outside with respect to the figure of the article and which, during the completion of the cycle, is trimmed and eliminated.

17. Device as in claim 16, characterized in that said vacuum means (45) are able to pre-form said film (19) so as to allow it to couple with the male-type part (12, 112, 212) of said mold (30, 130, 230).

18. Device as in claim 15, characterized in that said heating assembly (15) comprises at least one insulating element (40) cooperating with said heating element (39).

19. Device as in claim 15, characterized in that said frame (41) is of the replaceable type according to the type and size of said segment of film (19) to be heated and pre-formed.

20. Device as in claim 15, characterized in that said heating element (39) is of the at least partly plane type.

21. Device as in claim 15, characterized in that said heating element (39) comprises an electric resistance.

22. Device as in claim 15, characterized in that said heating element (39) comprises a metal plate provided with a hydraulic circuit for a heating liquid such as water or diathermal oil.

23. Device as in claim 15, characterized in that said anchor

- 27 -

means (21) comprise vacuum means (43) able to be selectively activated to couple said film (19) to said frame (41).

24. Device as in claims 15 and 16, characterized in that said anchor means (21) comprise vacuum means able to be
5 activated at least before and during the pre-forming step of said film (19).

25. Device as in claim 24, characterized in that it comprises means for the selective release of the vacuum, able to introduce ambient air between said film (19) and
10 said heating element (39) in order to accelerate the adhesion of the film to said zone of one of said parts of the mold (30, 130, 230).

26. Device as in claim 15, characterized in that it comprises ring-nut means (22) movable between a first
15 position outside said mold (30) and a second position at least partly superimposed over the perimeter of one (13) of said parts of said mold (30), wherein said heating assembly (15) is movable between a first position outside said mold (30), wherein it heats said film (19), and a second position
20 inside said mold (30), wherein it deposits said film (19) on said ring-nut means (22).

27. Device as in claim 17, characterized in that said anchor means (21) comprise vacuum means (43, 45, 47, 48, 49) able to be selectively activated before and during the
25 thermoforming of said film (19) inside said mold (30, 130, 230).

28. Device as in claim 15, characterized in that said first part (112) and said second part (113) are hinged together and able to close in book-like manner in order to make
30 polyurethane articles (137) covered on both sides by relative films (19), wherein said heating assembly (15) is movable from a first position wherein it first heats and then positions a first film (19) in cooperation with said

- 28 -

first part (112), and a second position wherein it first heats and then positions a second film (19) in cooperation with said second part (113).

29. Device as in claim 15, characterized in that said first
5 male part (212) and said second female part (213) are unconstrained and able to be superimposed in order to make polyurethane articles (237) covered on a single side by a relative film (19), wherein said heating assembly (15) is movable from a first position cooperating with said mold
10 (230), wherein it positions a first heated and pre-formed film (19) in cooperation with said second part (213), and a second position outside said mold (230), wherein it heats and possibly pre-forms a second film (19).

30. Device as in any claim from 15 to 29 inclusive,
15 characterized in that said heating element (39) includes zones of independent regulation in order to heat different zones of said film (19) in differentiated manner.

31. Device as in any claim from 15 to 30 inclusive, characterized in that it comprises a mold suitable for the
20 simultaneous formation of two figures, cutting means being provided in an intermediate position between said two figures in order to cut said film (19) into sections.

32. Device as in any claim from 15 to 31 inclusive, characterized in that said heating assembly (15) is
25 associated with handling/positioning means which allow to transport and move said heating assembly (15) into any horizontal, vertical or inclined position.

33. Polyurethane articles covered with a decorative film made of thermoplastic material, obtained with the method and
30 with the device as in any one of the previous claims.